Investigating Invasives: It Takes a Team

Though small and gentle, the glassy-winged sharpshooter can pose a major threat to familiar plants such as orange, lemon, and almond trees; grapevines; and oleander bushes; as well as to alfalfa and coffee.

In fact, this invasive insect represents a multibillion-dollar hazard to American agriculture. That's mainly because of its impressive ability to spread a plant-disease-causing bacterium, *Xylella fastidiosa.* Both insect and microbe are harmless to humans.

Scientists don't yet know how to sufficiently control *Xylella*. The same is true for the little leafhopper.

The leafhopper has some peculiarities that make it especially difficult to combat. Apparently, it can thrive exclusively on the sap that it sucks from target plants. It is remarkably effective at extracting whatever nutrients the sap might contain.

Efforts of ARS scientists and their co-investigators to rein in *Xylella* and the sharpshooters have won them a USDA Honor Award (see page 17).

Besides developing short-term solutions, such as insecticides and repellents, ARS is investigating tactics that may give long-term control.

Some examples:

- We are exploring many details about how the sharpshooters transmit *Xylella;* where the insect chooses to rest, feed, and lay its eggs; how some plants resist *Xylella;* and how to tell one strain of *Xylella* from another (see story, page 16).
- We are identifying the range of plant species that certain *Xylella* strains can infect.
- We are testing several species of tiny, stingless wasps, the sharpshooters' natural enemies, to see whether they can quash expanding sharpshooter populations (see story, page 18).
- We are experimenting with long-term cold storage of sharpshooter eggs that provide a home and food for the eggs of these wasps. When wasp young hatch, they feed on sharpshooter eggs, killing sharpshooter young. Successful storage of wasp-occupied sharpshooter eggs could give us a reliable supply of wasps to deploy at sharpshooter-infested sites.
- We are investigating another natural enemy—a fungus that is harmless to plants but may be a potent foe of sharpshooters.
- We have cooked up new meals that can be fed to laboratory-reared sharpshooters. We need large indoor populations of them for our tests of biological control agents, such as the fungus and the wasps, or for tests of environmentally safe insecticides.
- We are zeroing in on sharpshooter genes, with the intent of disrupting those critical to the insects' ability to develop strong wings and to produce viable eggs.
- We recently funded an ambitious and successful venture to decipher all the genetic material in the *X. fastidiosa* strain that afflicts grapes, causing what's known as Pierce's disease. This analysis of the *X. fastidiosa* genome will provide clues to vulnerabilities that we might be able to exploit. The American Vineyard Foundation, the California State Department of Food and Agriculture, and Brazil's São Paulo State Research Foundation were our partners in sponsoring this work.

In planning our sharpshooter research and our other investigations of unwanted invasive or exotic organisms, we coordinate with the National Invasive Species Council. The council is composed of pros from USDA and other federal departments and agencies.

Interestingly, even though the glassy-winged sharpshooter is native to Texas and the southeastern United States, it meets the council's definition of an invader: "Any plant, animal, or organism that is not native to the ecosystem under consideration and whose introduction is likely to cause harm to human health, the environment, or the economy."

The sharpshooter squarely fits this profile. It has wandered from its native range, first showing up in southern California in 1989. It has wreaked agricultural havoc there, spreading *X. fastidiosa* that killed 50 to 90 percent of the grapevines in affected vineyards within only 2 to 3 years.

The variety of crops that the glassy-winged sharpshooter attacks and the assortment of costly *X. fastidiosa* strains that it transmits warrant our nationwide efforts to rein in this invasive pest. We have carefully apportioned key aspects of the insect-bacterium-plant interactions into researchable projects. And we have expanded our staffing to broaden the array of scientific specialties that we are bringing to bear on this problem. Our approach may serve as a model for other federal "first-responder" research strategies to counteract the menace of invasive or exotic organisms.

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